BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PATENT SPECIFICATION

NO DRAWINGS

Inventor: VITAUTUS BALIO TOLUTIS

1,131,740

1,131,740

Date of Application and filing Complete Specification: 24 Aug., 1967.
No. 39042/67.
(Patent of Addition to No. 1093122 dated 18 Sept., 1964).
Complete Specification Published: 23 Oct., 1968.

Index at acceptance: —H1 K(1A1, 2S10, 2S11S, 2S19, 2S20, 3F, 4C23, 4F1A, 4F1B, 4F5, 4F18, 4F19)
Int. Cl.: —H 01 l 3/04

COMPLETE SPECIFICATION

Semi-Conductor Devices

We, INSTITUTE FYSIKI I MATEMATIKI, a Soviet Corporation, of Ulitsa Lentpjuvju, 7, Vilnyus, Union of Soviet Socialist Republics Union of Soviet Socialist Republics, do hereby declare the invention, for which we pray, that a patent may be granted to us, and the method by which it is to be performed, to be particularly described, in and by the following statement: —

This invention relates to computers and automation and constitutes an improvement in or modification of the method of preparing a film memory cell described and claimed in our co-pending application No. 24178 of 1963 (Serial No. 1093122).

As a modification of the method of preparing the film memory cell a thin layer of selenium, 2 to 3 microns thick, alloyed with silver is built up in a selenium diode in the rectifying contact region between a layer of selenium and a layer of cadmium selenide, or a layer of another semiconductor or metal producing in conjunction with selenium a rectifying contact. The concentration of silver may vary from several fractions of a per cent to several per cent. The layer of selenium alloyed with silver may be replaced by a layer of silver selenide of a thickness from 1 to 2 microns. Alternatively the layer of pure selenium and the layer of selenium alloyed with silver, or the layer of silver selenide, may be replaced with a single layer of silver selenide 5 to 10 microns thick and the cell electroformed by reverse current.

A suitable substrate for the cell may be a semi-conductor, with an optimum coefficient of linear thermal expansion α of 22.10^{-6} deg. C. $^{-1}$. Whenever the α of the substrate materially differs from the α of selenium, for instance, when the cell is prepared on the surface of a germanium or silicon monocrystal, it is advisable to affix the selenium layer by building up a sub-layer displaying a good cohesion with the substrate surface and a satisfactory cohesion with the lower ohmic contact of the cell, for instance a thin layer of bismuth. A variant of cell preparation is described below. In this example the α of the substrate disagrees with the α of selenium the substrate comprising, for instance, a germanium or silicon monocrystal.

A layer of aluminium up to 1 micron thick may be sprayed in high vacuum on the monocrystal surface with the aid of a stencil having the configuration of the cell and a current lead. The last decimal fractions of aluminium are sprayed in conjunction with the bismuth. The temperature of the substrate (monocrystal surface) ranging from 120 to 150°C., the surface of the layer thus obtained should have a slightly dull look.

After the bismuth has been sprayed the vacuum conditions are not disturbed and a layer of pure (unalloyed) selenium is sprayed to a thickness of 5 to 7 microns, the crystal temperature being maintained at about 50°C. The layer is crystallised in atmospheric conditions at 200°C for one hour. The hexagonal selenium layer prepared as above has a texture with the axis C oriented along the monocrystal surface.

Under such conditions the surface of the selenium layer is covered with a layer of selenium mixed with silver built up by spraying to a thickness of 2—3 microns. The higher the silver concentration, the larger the commutation time I of the cell and more stable the states 1 and 0 are. Depending on silver concentration, the time I varies from several microseconds to a few milliseconds, and the information can be read off several

[*Price 4s. 6d.*]

SEE ERRATA SLIP ATTACHED

dozen times to 10^7 to 10^9 and even more times.

An upper rectifying contact can be made of cadium alloyed with tin; this cadium layer being 0.5—1.0 microns thick covered with a thick layer of tin of 1 to 3 microns. The upper cell electrode is connected with the respective elements of the film or solid circuit by leads provided by pulverisation through stencils.

Other methods of preparing the cell can be used. For instance the layer of selenium alloyed with silver can be substituted by a layer of silver selenide interposed between the layer of pure selenium and the upper electrode; or the layer of pure and alloyed selenium may be replaced by a single layer of silver selenide.

In such cases the cell is required to be electroformed in blocking direction for a lengthy period of time in order to obtain a layer of selenium with silver admixture in the rectifying contact region at the expense of silver selenide.

WHAT WE CLAIM IS:—

1. A method of preparing a memory cell in which a thin layer of selenium, 2 to 3 microns thick, alloyed with silver is built up in a selenium diode in the rectifying contact region between a layer of selenium and a layer of another semiconductor or metal producing in conjunction with selenium a rectifying contact.

2. A method according to claim 1 wherein the layer of selenium alloyed with silver is replaced by a layer of silver selenide of a thickness from 1 to 2 microns.

3. A method according to claim 1 or 2 wherein the layer of non-alloyed selenium, and the layer of selenium alloyed with silver or the layer of silver selenide, are replaced with a single layer of silver selenide 5 to 10 microns thick and the cell is electroformed by reverse current.

4. A method of preparing a memory cell substantially as herein described.

MARKS & CLERK
Chartered Patent Agents
Agents for the Applicant(s)

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1968.
Published by the Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.